Analysis of Generalized Nonlinear Quadrature for Novel Fractional-Order Chaotic Systems Using Sinc Shape Function

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Abstract

This work provides the generalized fractional differential quadrature method, which is focused on the generalized Caputo kind and has been utilized for the first time for solving nonlinear fractional equations. The cardinal sine shape function is one of the effective shape functions of this method that is used in conjunction with the fractional operator of the generalized Caputo kind to convert nonlinear fractional equations into a nonlinear algebraic system. The nonlinearity problem is then solved using an iterative approach. Numerical simulations for a variety of chaotic systems are introduced using the MATLAB program and compared with previous theoretical and numerical results to ensure their reliability, convergence, accuracy, and efficiency. As a result, numerical simulations show that the cardinal sine shape function outperforms other techniques in terms of accuracy, convergence, and reliability. We confidently predict that the presented generalized fractional differential quadrature method and algorithm will be used to express and simulate many chaotic systems and generalized Caputo-type fractional problems in the future.

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